

SINGLE AXIS ANALOG POSITIONER WITH POSSIBILITY OF PROGRAMMING AT EACH PACE OF THE POSITIONING SPEED, SETTING OF OUTPUTS AND TYPE OF PACE INCREASING.

HB 760.03A



User manual

Supplement to the "Installation, maintenance and servicing manual"



*Quality in Electronic
Manufacturing*

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CHAPTER 1

INTRODUCTION

Supplementary nature of manual

References

Responsibility and validity

Description of operation

1 - 1 SUPPLEMENTARY NATURE OF MANUAL

This manual is to be considered as a supplement to the "Installation, maintenance and servicing manual", which contains information on wiring, checking and eliminating faults, start-up and maintenance procedures. This manual gives instructions on the use and correct programming of the instrument.

You are urged, therefore, to read the manual carefully and, if you have any queries, to contact QEM for further explanations by sending the assistance fax contained in the manual.

1 - 2 REFERENCES

The documentation on the instruments designed and sold by QEM has been divided into different booklets for effective and speedy consultation, based on the specific type of information required.

<i>User manual</i>	<i>Hardware structure</i>	<i>Installation, maintenance and servicing manual</i>
<i>Explanation of software.</i>	<i>Basic information on the standard hardware in the series plus customisation possibilities.</i>	<i>All the necessary information for installation, maintenance and servicing.</i>
This is this manual, giving all the necessary information for the understanding and use of the instrument described. The manual deals with the instrument software, with information on the understanding, programming, calibration and use of the instrument described. After installing the instrument, following the instructions in the installation, maintenance and servicing manual, this user manual gives all the necessary instructions on the correct use and programming of the instrument.	This booklet is appended to the user manual and describes the standard hardware configuration for the series of instruments described. It also gives the standard electrical, technical and mechanical specifications of the series, together with the hardware customisation possibilities in relation to the different software versions.	All the essential details on the correct maintenance and installation. The aim is to provide you with valid and accurate information for the manufacture of products of recognised quality and reliability. It also gives valid supporting information for servicing applications with QEM instruments installed.

1 - 3 RESPONSIBILITY AND VALIDITY

RESPONSIBILITY

QEM declines all responsibility for any injury to persons or damage to objects resulting from the failure to observe the instructions and rules in this manual and the "Installation, maintenance and servicing manual". It is furthermore specified that the customer/purchaser is bound to use the instrument according to the instructions provided by QEM and, if any doubts arise, to send a written query to QEM. Any authorisation for exceptions or substitutions in use, if contested, will be deemed valid by QEM only if in writing.

The reproduction or handing over of all or part of this manual to third parties without the written authorisation of QEM is forbidden. Any transgression will result in a claim for compensation for the damages sustained.
All rights deriving from patents or designs are reserved.

QEM reserves the right to make partial or complete modifications to the characteristics of the instruments described or corresponding documentation.

Objective

The objective of this manual is to give the general rules for the use of the instrument described.

Conservation of parameters

Write down all the instrument setting and programming parameters and keep them in a safe place, to facilitate any future replacement or servicing operations.

VALIDITY

This manual is applicable to all instrumentation designed, manufactured and tested by QEM with the same order code. This document is valid in its entirety, barring errors or omissions.

<i>Instrument release</i>	<i>Manual Release</i>	<i>Modifications to manual</i>	<i>Date of modifications</i>
5	0	New Manual	29 / 01 / 97
5	1	Modified the description of output 2.	24 / 06 / 97
6	2	Manual for new hardware version (A) Inserted BACKUP/RESTORE function.	08 / 06 / 98

1 - 4 DESCRIPTION OF OPERATION

The instrument HB 760.03 is a single axis analog positioner which allows to enter absolute or incremental levels, to choose the positioning speed of the axis at each step. An output code allows to activate 4 outputs at the start or the end of the step to allow the user to configure the processing according to the step in use. A step code allows furthermore to set a sequence of end and start of step, adapting it to the step in use. The programs memory is of 2500 steps which can be divided according to user's needs. The maximum limit of programs is 99 and each program is limited to 250 steps. The instrument is provided with a **BACKUP/RESTORE** function for storage and recovery of data relative to the instrument's preset parameters (set-up, axis calibration, ...), excluding work parameters. Data is stored on a non-volatile device.

CHAPTER 2

OPERATOR / MACHINE INTERFACE

Description of keyboard

Description of inputs

Description of outputs

2 - 1 DESCRIPTION OF KEYBOARD

Key	Function
÷	Normal operation: pressed after the "F1" and "F2" keys, they select the functions available. Data input: allows entry of data.
	Normal operation: selects the display of the cycle. Impulse pressure selects the successive display. Continuous pressure selects the previous display. Data input: scrolling of the various parameters. Impulse pressure selects the successive parameter. Continuous pressure selects the previous parameter.
	Normal operation: selects the display within the chosen function. Data input: not used.
	Normal operation: allows access to and exit from the available manual functions. Data input: not used.
	Normal operation: allows access to and exit from introduction of the working programs. Data input: not used.
	Normal operation: allows selection of the available functions. Data input: allows the output of the functions which can be selected with "F1" + "Numerical key".
	Normal operation: allows selection of the available functions. Data input: allows the output of the functions which can be selected with "F2" + "Numerical key".
	Normal operation: not used. Data input: Inserts the decimal point.
	Normal operation: not used. Data input: Inserts or removes the +/- sign.
	Normal operation: not used. Data input: deletes the input value and reverts to the old value.
	Normal operation: not used. Data input: stores the datum entered.
	Access to password-protected functions.
	Choice of the working cycle to be executed.
	Execution of the working cycle.
	Input and output diagnostics.

Continued on next page

<i>Key</i>	<i>Function</i>
 + 	P.I.D. parameter programming.

2 - 2 DESCRIPTION OF INPUTS

Characteristics of inputs

Refer to the chapter entitled “Electrical characteristics” in the “Hardware structure” booklet appended to this manual.

Name		Operating logic	Activation mode	Polarizer
Description				
I1	ON	I/C	P1	ZERO IMPULSE ENABLING. It enables the reading of the zero impulse during the preset research. Its operation is programmed in SET-UP . During the preset research the Maximum and Minimum levels are not influent.
I2	ON	I	P1	START. In automatic it controls the positioning to the selected level. If the positioning is interrupted with a stop or with the switching OFF of the instrument, the activation of input I2 restarts the positioning from the point in which it was interrupted.
I3	ON	I	P1	STOP. Its activation brings to zero with ramp of deceleration the analog reference supplied by the instrument. In automatic it interrupts the execution of the level in use. To end the positioning it is necessary to provide again a start. In manual it interrupts the execution of the manual positionings. To end the positioning it is necessary to provide again a start. It interrupts the cycle in execution (if a positioning is under execution, it interrupts the positioning). With this input active the instrument doesn't acquire any input command.
I4	ON/OFF	C	P1	MANUAL (OFF) / AUTOMATIC (ON). It selects the manual or automatic mode of the instrument. In manual it is enabled the programming of parameters of SET-UP, the movements of the axis with the inputs I7 and I8, the preset research and the axis calibration. In automatic it is enabled the positioning at the program level, at the home level and at the level delta. Passing in manual or emergency it is given a stop to the cycle which needs a start to be resumed.
I5	ON	C	P1	STARTUP ENABLING. It informs the instrument that the startup is enabled. With the input I5=OFF the axis is not in space reaction, the analog output is forced to zero and the output U3=OFF. The toggling of input I5 from OFF to ON restarts the space reaction of the axis.
I6	ON	I	P1	PRESET RESEARCH (MANUAL) / HOME RETURN (AUTOMATIC). In manual the input I6 controls the preset research. If activated during the preset research it reverses the direction of the research. In automatic, when the axis is stopped, it controls the positioning at the home level.
I7	ON	C	P1	FORWARD (MANUAL) / D LEVEL(AUTOMATIC). In manual it controls the forward movement of the axis at fast or slow speed set from keyboard. In automatic with the axis stopped it controls the positioning of the axis at the level in execution+D level. When the input I7 becomes OFF the axis returns to the level that was in execution at the beginning.
I8	ON	I/C	P1	BACKWARD(MANUAL) / PACE INCREMENT. In manual it controls the backwards movement of the axis at the manual speed. In automatic with the axis stopped it controls the increase of pace if the pace code in use is 41 (see description of key MENU), and the new positioning. If the code in use is 42 it increase the pace but the start must be activated to perform the positioning. The activation of input I8 (pace increment) disactivates the tolerance output if the axis is out of the new tolerance range.

Key

C = Continuous signal

I = Impulse signal

Name

	Description
+	Transducers positive power supply. Positive voltage supplied by instrument for instrument and transducers inputs power.
-	Transducers negative power supply. Negative voltage supplied by instrument for instrument and transducers inputs power.
GND	Ground connection. A conductor of $\varnothing$ 4 mm is recommended.
Vac	Instrument power supply voltage. Alternating voltage according to the code in your order.
Vac	Instrument power supply voltage. Alternating voltage according to the code in your order.

COUNT INPUTS

Name	Operating logic	Polarizer
-------------	------------------------	------------------

F1	N / P	PE	Input "phase A" incremental transducer.
F1	N / P	PE	Input "phase B" incremental transducer.
Z1	N / P	PE	Input Zero pulse incremental transducer.
F2	N / P	PE	Not used.
F2	N / P	PE	Not used.
Z2	N / P	PE	RESTART. It re-executes the cycle in use from the beginning. At the end of a cycle, if the input Z2 is activated, it is automatically provided a restart. For characteristics of the count inputs please refer to the chapter "Electrical characteristics" in the "Hardware structure" booklet appended to this manual.

Key

N = Transducer with NPN logic.

P = Transducer with PNP logic.

In set-up the parameter "Codification of expansion inputs" (Tipo codifica ingressi) must be set to zero. Refer to the chapter entitled "Electrical characteristics" in the "Hardware structure" booklet appended to this manual.

Name	Operating logic	Activation mode	Polarizer
I9	ON	C	P2
I10	ON	C	P2
I11	ON	C	P2
I12	ON	C	P2
I13	ON	C	P2
I14	ON	C	P2
I15	ON	C	P2

Description

I9 **ON** **C** **P2** **Binary code of program selection.** Value 2⁰. If activated, it select the 2⁰ value of the binary code for the program selection.

I10 **ON** **C** **P2** **Binary code of program selection.** Value 2¹. If activated, it select the 2¹ value of the binary code for the program selection.

I11 **ON** **C** **P2** **Binary code of program selection.** Value 2². If activated, it select the 2² value of the binary code for the program selection.

I12 **ON** **C** **P2** **Binary code of program selection.** Value 2³. If activated, it select the 2³ value of the binary code for the program selection.

I13 **ON** **C** **P2** **Binary code of program selection.** Value 2⁴. If activated, it select the 2⁴ value of the binary code for the program selection.

I14 **ON** **C** **P2** **Binary code of program selection.** Value 2⁵. If activated, it select the 2⁵ value of the binary code for the program selection.

I15 **ON** **C** **P2** **Binary code of program selection.** Value 2⁶. If activated, it select the 2⁶ value of the binary code for the program selection.

C = Continuous signal
I = Impulse signal

Characteristics of input expansion with BCD code (option E)

In set-up the parameter "Codification of expansion inputs" (Tipo codifica ingressi) must be set to 1. Refer to the chapter entitled "Electrical characteristics" in the "Hardware structure" booklet appended to this manual.

Name	Operating logic	Activation mode	Polarizer
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				Description
I9	ON	C	P2	BCD code of program selection. Value 2^0 unity.
I10	ON	C	P2	BCD code of program selection. Value 2^1 unity.
I11	ON	C	P2	BCD code of program selection. Value 2^2 unity.
I12	ON	C	P2	BCD code of program selection. Value 2^3 unity.
I13	ON	C	P2	BCD code of program selection. Value 2^0 tens.
I14	ON	C	P2	BCD code of program selection. Value 2^1 tens.
I15	ON	C	P2	BCD code of program selection. Value 2^2 tens.
I16	ON	C	P2	BCD code of program selection. Value 2^3 tens.

2 - 3 OUTPUTS

Characteristics of inputs

Refer to the chapter entitled “Electrical characteristics” in the “Hardware structure” booklet appended to this manual.

Name		Operating logic		Activation mode		Polarizer	
			</				

Key

C = Continuous signal

I = Impulse signal

CHAPTER 3

SETTING UP FOR OPERATION

Set-up

Calibration



3 - 1 SET-UP

As these parameters set the operating mode of the instrument, access is restricted to the installer only. A password must be entered to access the programming, with the following procedure:

Description	Keyboard	Display
Access the set-up programming.	F1 + PASS 0	Password?
Introduce the access code "760" and confirm with ENTER .	7 6 PASS 0 ENTER	0
Exit is possible at any time after introducing the password by pressing the key shown.	F1	

FUNCTION	DISPLAY	DESCRIPTION
Display mode	High definition reading 0	0= Normal display. 1= Display with systemHDR (High definition reading). See dedicated paragraph.
Expansion enabling I/O	Abilitazione espansione I/O 0	0= Disabled. 1= Enabled.
Decimal digits	Cifre decimali 0	It specifies the number of digits after the decimal point in the visualizations (max. 3).
Encoder resolution	Risoluzione 4.00000	This parameter indicates by how much you must multiply the revolution impulses of the encoder to provide the displaying of the lengths in the desired units of measure. You can enter values from 0.00200 to 4.00000 upon consideration that the frequency of phases F1 must not exceed the maximum frequency of count of the instrument. The formula to calculate the resolution is the following:: $R = \frac{\text{Shifting obtained with the rotation of 1 encoder revolution (whole N°)}}{\text{N° of impulses of encoder revolution}}$ If for example we have a shifting by 123,4 mm. and an encoder of 500 imp./revolution: $R = \frac{1234}{500} = 2,468$
Manual operation mode	Funzionamento manuale 0	0= The manual shifting is performed with the axis in space reaction. 1= The manual shifting is performed without space reaction. In this case the axis may move independently from the controls and it is not enabled the shifting at an immediate level.
Speed unit	Unità' velocità 0	It specifies whether the unit of measure (Um) of the axis' speed is in minutes or in seconds. 0= Um / min. 1= Um / sec.



FUNCTION	DISPLAY	DESCRIPTION
Maximum speed	Velocita' massima 1234	With this parameter it's set the maximum speed of the axis when the analog voltage AN1 is at 10 Volt. To be calculated experimentally. The value must be in the unit of measure programmed (max. 9999 Um / min. or Um / sec.).
Manual speed	Velocita' manuale 1234	With this parameter it's set the manual speed of the axis (max. 9999 Um / min or Um / sec.). The value introduced must be lower or equal to the maximum speed.
Slow manual speed	Velocita' manuale lenta 1234	With this parameter it's set the slow manual speed of the axis (max. 9999). The value introduced must be lower or equal to the manual speed.
Test speed	Velocita' di test 1234	With this parameter it's set the speed of the axis during the execution of the test for the calibration of parameters P.I.D. (max. 9999 Um / min or Um / sec.).
Home speed	Velocita' di home 9999	With this parameter it's set the speed of the axis during the positioning at the home level (max. 9999 Um / min or Um / sec.).
Preset speed	Velocita' preset 9999	With this parameter it's set the speed during the preset research (max. 9999 Um / min or Um / sec.).
Speed of research of zero impulse	Vel. ric. imp. zero 9999	With this parameter it's set the speed of the axis after the enabling of impulse of zero has been activated (max. 9999 Um / min or Um / sec.). The value entered must be lower or equal to the preset speed.
Speed of Δ levels	Velocita' di delta quota 1234	With this parameter it's set the speed (expressed in Um / min. or in Um / sec.) of the axis during the level + Δ shifting (by activating the input I7).
Acceleration	Accelerazione 10.00 sec.	With this parameter it's set the ramp of acceleration of the axis; time used by the axis to go from 0 speed to maximum set speed in SET-UP (max. 10 seconds).
Deceleration	Decelerazione 10.00 sec.	With this parameter it's set the ramp of deceleration of the axis; time used by the axis to go from maximum set speed in SET-UP to the zero speed (max. 10 seconds).
Tolerance	Tolleranza 123	Limit of absolute tolerance allowed to the axis positioning (max. 999 Um).
Time of delay of tolerance activation	Tempo attesa out tolleranza 0.000	It is the delay time, expressed in seconds, of output U1 activation when the axis has entered in the tolerance range. By introducing the zero value, the activation of output U1 is immediate (min. 0,000 max. 9,999 sec.).
Minimum time of activation outputs U1 and U4	Tempo minimo out U1-U4 99	It is the minimum activation time (expressed in ms.) of outputs U1 and U4.



FUNCTION	DISPLAY	DESCRIPTION
Inversion time	Tempo inversione 9.99 sec.	To avoid possible mechanical stress due to too rapid inversions in the axis' movement direction, you can enter a delay time of inversion in seconds (min. 0,01 max. 9,99).
Follow up error	Errore inseguim. 1234	It is the maximum difference acceptable (expressed in primary impulses encoder $\times 4$) between the position reached by the axis and the position which it should have reached, besides which it is signalled the follow up error disactivating output U3 (max. 999999).
Type of preset loading	Caricam. preset. 0	0= The loading of the preset level is performed at the disactivation of the input of zero impulse enabling after the axis has inverted the direction. 1= The loading of the preset level is made upon the activation of the zero impulse after the axis has inverted the direction and the input of zero impulse enabling has been disactivated. 2= It is not activated a procedure of preset research and upon the activation of the input pre-arranged, the preset level is loaded on the axis calculation (see dedicated paragraph).

This displaying appears if the parameter "Type of preset loading" is=0 or 1

Direction of preset research	Direzione ric. preset 0	0= The axis is directed forward if the level of preset is nearest to the maximum level or it goes backwards if the preset level is nearest to the minimum level. 1= The axis goes forward. 2= The axis goes backwards.
Maximum level	Quota massima 999999	It is the maximum working position allowed to the program. If the level in execution is greater than the maximum level, the axis goes to the maximum level..
Minimum level	Quota minima 999999	It is the minimum working position allowed to the program. If the level under execution is lower than the minimum level, the axis goes on the minimum level.
Preset level	Quota preset 999999	It is the level which is loaded on the count with the zero impulse of the transducer encoder if it is activated the input Z1. It is possible to enter a level included between maximum level and minimum level.
home level	Quota di home 999999	It is the level executed when it is activated the home level input (I6).
Shifting delta	Delta spost. 999999	It is the increasing level added to the level in use when it is activated in automatic the input of Δ level. The positioning to the new level is executed.
Data P.I.D.	Accesso dati P.I.D. 0	Access to reading and/or writing of data P.I.D. 0= Access not enabled. 1= Access to the data reading. 2= Access to the data reading and writing.



FUNCTION	DISPLAY	DESCRIPTION
Start delay	Ritardo partenza 9.99 sec.	Delay (in seconds) between the activation of the start input and the beginning of the axis movement.
Choice of working speed programming	Scelta velocita' 0	0= The speed value to program in the pace is expressed in percentage compared to the maximum speed. 1= You can select a speed value corresponding to the entered number (1÷10) in the program's pace.

This displaying appears only if the parameter "Choice of programming of working speed" is=1

Working speed 1 10	Velocita' lavoro 1 9999	With this parameter it's set the working speeds of the axis (max. 9999 Um/ min or Um/sec.). 10 speeds are available VL1, VL2, VL3, VL4 VL10.
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Pace increase waiting time 1÷9	Timer attesa 1 99.99	It is the waiting time (max. 99,99 seconds), for the automatic axis' restart at the next pace (selected in the paragraph "Description of code of pace increasing"). 9 timers are available (T1÷T9).
Enabling control of space reaction delay	Abilit. reazione di spazio 1	0= Disabled. The axis is always in space reaction. 1= Enabled. It is possible to schedule the waiting time in space reaction after a positioning.
Waiting time for the disabling of space reaction control	Tempo di attesa reazione 9.99	It is the waiting time, expressed in seconds, for the disabling of space reaction control after a positioning or a stop.
Re-phasing enabling	Abilitazione rifasamento 1	0= Disabled 1= Enabled. In automatic, upon the activation of I1 is acquired the re-phasing preset and after the restart the count is rephased 2= Enabled using the input I1 as enabling to the reading (impulsive) of Z1. 3= Enabled using the input I1 as enabling to the reading (continuous) of Z1. N.B the enabling re-phasing are enabled only in automatic

This displaying appears only if the parameter "Rephasing enabling" is=1

Preset re-phasing	Preset rifasam. 500.0	It is the rephasing level enabled with "Rephasing enabling"=1". Max.999.9
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This displaying appears only if the parameter "Rephasing enabling" is ≠0

Input I1 activation time	Tempo attivaz- I1 Rif. 1	It is the minimum time of activation of input I1 used during the rephasing (milliseconds). By introducing the zero value the input is in interruption (if rephasing ≠3).
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FUNCTION	DISPLAY	DESCRIPTION
Start activation time (I2)	Tempo attivaz- start 5	It is the minimum time (milliseconds) of activation of start input (I2).
Codification of expansion inputs	Tipo codifica ingressi 1	0 = Binary. 1 = BCD.
Messages language	Lingua messaggi 1	Choice of the language of the displayed messages. 1 =ITALIAN. 2 =ENGLISH. You can select further languages upon request made by the customer, together with the translation.
Once the programming of the last function is achieved,the display returns to the first parameter		

3 - 2 CALIBRATION

THE PROCEDURE FOR CALIBRATING THE ANALOG OUTPUT

The setting of some set-up parameters.

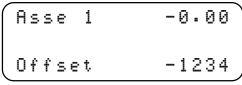
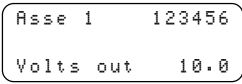
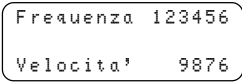
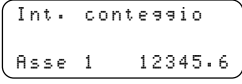
Set in set-up the parameters relative to *decimal digits, transducer resolution, speed units*.

Description	Keyboard	Display
Access to the calibrating procedure Select the manual function (I6 = OFF). Introduce the password "123" and confirm with ENTER .	+	Password? 123
This key allows selection of three different displays: "Volts out" (value of analog output voltage), "Offset" (to calibrate the offset of the analog output) and "Int. count" (introduction of a value in the count).		
		Asse 1 123456 Volts out 10.0
		Asse 1 -0.00 Offset -1234
		Int. conteggio Asse 1 12345.6
Checking connections First check that the speedometer dynamo is connected properly with the drive. Select the display relative to "Output voltage (Volts out)" and, using the numerical keyboard, introduce a voltage value, and confirm with the key ENTER . We recommend the introduction of a rather low voltage value (e.g. 0.5 V) and to observe if the motor turns at about 1 / 20 of its maximum speed (if activation accepts a maximum voltage of 10V). By providing a positive voltage from the keyboard, the motor should turn "frontwards" at a speed proportional to the value introduced, and the count displayed must be increased.		Asse 1 123456 Volts out 10.0
	÷	

N.B. The voltage value introduced from the keyboard is provided by the analog output without acceleration ramp.

Continued on next page



Description	Keyboard	Display
Offset calibration Using the key shown, select the display relative to the calibration of the analog output (Offset). The value introduced serves to compensate the eventual variation of the analog output provided by the instrument due to weather, temperature, etc. It is important that the drive is calibrated correctly (when the input is disconnected, the motor must remain at a standstill), so that the offset action is used only to calibrate the instrument's analog output. The operator can use the numerical keys and sign to introduce any value which, when confirmed with ENTER, will be immediately be presented in output. The offset calibration can be considered terminated when the value of the analog output provided by the instrument is equal to zero (to be checked with a digital multimeter with lower scale set in millivolts).	  ÷  	
Calculation of maximum speed The instrument now has the capacity to calculate and display the value of maximum speed to be introduced in set-up (parameter "Maximum speed"). Select the display relative to the output voltage and introduce the value 10 (10 volt = maximum motor speed). N.B. The voltage value introduced from the keyboard will be provided by the analog output without acceleration ramp.	  ÷  	
While the axis is in movement at maximum speed, press the key shown. The frequency count (detected on the transducer phase) and the value of maximum speed will be shown (data to be inserted in set-up in the "Maximum speed" parameter). In this display it is possible to introduce a filter on the display by pressing the key ENTER.	 	
N.B. If it is not possible to move the axis at maximum speed, introduce a voltage equal to 1 V. The speed and frequency displayed must be multiplied by 10.		
To return to the previous display, press the key shown.		
Introduction of a value in the count It is possible to modify the count value displayed by the instrument (axis position). Select the display for the introduction of a value in the count and introduce the required value, then confirm with ENTER.	  ÷  	

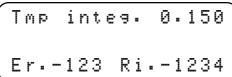
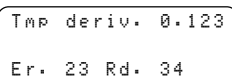
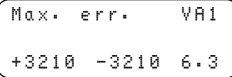
PROCEDURE FOR P.I.D. CALIBRATION

P.I.D. calibration must be carried out after the calibration of the analog output (see paragraph concerning the calculation of maximum speed). Before starting P.I.D. calibration, in set-up set the parameters: "Decimal digits", "Encoder resolution", "Speed Unit", "Maximum speed", "Test speed", "Acceleration/deceleration ramps" and "Inversion time". Access the P.I.D. calibration function (see below) and, setting the value "0" for the enabling of P.I.D. tests (only data writing), reset the parameters for "Integral time" and "Derivative time" and set to 100% the "feed-forward" value. Refer to the "Manual of Installation, Maintenance and Assistance".

Description	Keyboard	Display
To access calibration of P.I.D. parameters, in set-up the parameter "P.I.D. data" <u>must be set so as to enable access to the reading and writing of data.</u> Access the P.I.D. calibration function. Test level insertion The parameter "Abilitazione test P.I.D." must be set to 1. The instrument asks for the test level insertion. It is the shifting the axis has to do in both directions during the calibration procedure. Once confirmed with ENTER the axis moves to the test level, wait for the inversion time and with the acceleration-deceleration ramps, goes back to the starting level. This movement continues for all the calibration time. Gain calibration Select the display relative to the proportional gain. Introduce the value "0.001". Initially the axis is very slow, the acceleration/deceleration ramps are not respected, the maximum speed is not reached, signifying that the set value is too low. Increase the value until the system is dynamically satisfactory without becoming unstable (swinging with axes in movement and vibrations with the axes at a stop). Feed-forward calibration Select the display relative to the feed-forward (values are in percentage 100 = 100%). In normal conditions feed-forward must be set to values near 100. Display on the lower left indicates the error that must be near 0. maximum error will be on ramps. Modify the feed-forward value to reduce to 0 the error during the constant speed part of the movement.	+ or ÷ ÷ ÷	

Continued on next page



Description	Keyboard	Display
Calibration of integral time Select the display relative to integral time (expressed in seconds). Starting from a base of 0.500 seconds, gradually decrease the time until arriving at a value thanks to which the axis improves its dynamic performance and remains stable (does not swing). The introduction of an insufficient integral time would create low-frequency swings, while too high a value would give high frequency oscillations. By setting the value 0 the function is excluded.	  ÷  	
Calibration of the derivative time Select the display relative to derivative time (expressed in seconds). Starting from a base of 0.001 seconds, it is necessary to gradually increase the time until arriving at a value thanks to which the axis improves its dynamic performance and remains stable (does not swing). By setting the value 0 the function is excluded.	  ÷  	
Press the shown key to display the maximum error of positive and negative space calculated by the instrument every 50 milliseconds. To return to the previous display, press again the key shown.		
To exit the function at any time, press key F2; the instrument will revert to the original displays.		

CHAPTER 4

USE

Work programs and auxiliary functions

Operation graphs and tables



4 - 1 WORK PROGRAMS AND AUXILIARY FUNCTIONS

MEMORY ERASING

Description	Keyboard	Display
Access the memory erasing function.	F1 + PASS 0	Password? 0
Enter access code "456" and confirm with ENTER ; a request is made to select the function required.	D 4 E 5 F 6 ←	Cancellazione Totale_1 Prog_2
A request is made to choose if erase the complete memory or a program. The operator can erase the total memory by pressing the key shown.	A 1	Memoria cancellata!
The memory erased confirmation is shown for 3 seconds.		
The operator can erase a single program by pressing the key shown.	B 2	Cancellazione programma 2
A request is made to select the program number to be erased. The operator can introduce the value and confirm with ENTER .	PASS 0 ÷ → 9 ←	Memoria cancellata!
The program erased confirmation is shown for 3 seconds.		
To exit the function, press the key shown. The screen will return to the display in use.	F1	

INTRODUCTION OF WORKING PROGRAMS

Description	Keyboard	Display
Access the working program introduction.		Introduzione Programma 1
A request is made to introduce the program number desired, confirm with ENTER .	FASS 0 ÷ 9 ↵ FASS 0 ÷ 9 ↵	1 Q.12345.6 1 V 70 115C132
The display shows the first pace of the selected program. Via the numeric keyboard the operator may enter the positioning level, the shifting speed in percentage or to choose it from SETUP in the parameter "Working speed", the code of outputs activation U5, U6, U7, U8 and the code for pace increase (C132). Confirm with ENTER .	FASS 0 ÷ 9 ↵	2 Q.-3456.7 1 V100 U 12C10
The display shows the second pace of the selected program. Via the numeric keyboard the operator may enter the positioning level, the shifting speed in percentage or to choose it from SETUP in the parameter "Working speed", the code of outputs activation U5, U6, U7, U8 and the code for pace increase. Upon confirmation with ENTER of the code for pace increase the display shows the third pace and so on, up to pace n. 250.	FASS 0 ÷ 9 ↵	Uscite 56__ Velocita' 450
The operator may verify with the outputs code which outputs have been selected and the speed with which is controlled the positioning.		
To go back to the previous display press again the key shown.		
To exit from the program writing press the key shown; only the value confirmed with ENTER will be memorised. Display will show the previous visualization.		

Description of speed programming

It is possible to set the speed with which to perform the positioning by using two methods selectable in SET-UP with the parameter "Choice of programming of working speed".

Choice of programming of working speed=0.

The value to be entered is in percentage compared to maximum set speed in SET-UP (limit values 1%÷100%).

Choice of programming of working speed=1.

It is possible to select the value of a programmed speed in SET-UP at the corresponding number (1÷10).

Continued on next page.

Description of outputs code

It is possible to activate or deactivate the outputs U5, U6, U7, U8 which shall remain in their status until it is not placed under execution a new code for outputs. The real table of outputs is as follows::

Insert number	Outputs' state			
	U5	U6	U7	U8
X00	OFF	OFF	OFF	OFF
X01	ON	OFF	OFF	OFF
X02	OFF	ON	OFF	OFF
X03	ON	ON	OFF	OFF
X04	OFF	OFF	ON	OFF
X05	ON	OFF	ON	OFF
X06	OFF	ON	ON	OFF
X07	ON	ON	ON	OFF
X08	OFF	OFF	OFF	ON
X09	ON	OFF	OFF	ON
X10	OFF	ON	OFF	ON
X11	ON	ON	OFF	ON
X12	OFF	OFF	ON	ON
X13	ON	OFF	ON	ON
X14	OFF	ON	ON	ON
X15	ON	ON	ON	ON

If **X=0** the outputs will be activate at the beginning of the pace

If **X=1** the outputs will be activate at the end of the pace (tolerance output).

It is possible to verify the programmed state by pressing the key  after entering the outputs' code.

Continued on next page.

Description of pace increasing code (max. 255)

The pace increase code allows to adapt the operation cycle of pace change according to the processing to be made.

- Value from **X01÷X09**. Axis move to the selected level and the waiting timer starts when the tolerance output will turn on (waiting timer is selected by the number introduced and the corresponding values are programmed in SET-UP). Upon expiring of the time, it is made the increase of pace and it is controlled automatically the new positioning..
- Value **X31**. The axis is not positioned at the level which has been set, but when reaching this level, it is made the pace increase with an on fly speed change. The tolerance output is not set and the concerned outputs by the "outputs code" will not be set at the speed change. It is possible to manage up to a maximum of 30 codes of pace increase equals to 31. It is not possible to enter the code "231". A non interrupted sequence of X31 codes must be totally made of absolute or increasing positionings. The first pace increasing code after an X31 code must have the same type of shifting (absolute or increasing) and it's the level of the positioning with on fly speed changes. The data reading for the speed change is only progressive and not provided with feedback. The data reading for the speed change is only progressive and not provided with retroaction. In case during the operation in some way the axis is brought back, all speed changes which have already been made, will not be repeated.
- Value **X32**. The axis is positioned at the programmed level and when it is activated the tolerance output, the pace increase is made. When the tolerance output is deactivated, after the time set in SET-UP, it is automatically executed the new positioning (start on the descent front of output U1). The tolerance output remains activated for the minimum time set in SET-UP, if placing in execution the following pace, it is changed the tolerance range. If the following pace does not show a positioning at a level, the output remains activated (because we remain in tolerance).
- Value **X33**. The axis is positioned at the programmed level and when it is activated the tolerance output the pace increase is made, the tolerance output is deactivated and the start (I2) controls the new positioning. From input I2 depends only the following start of the axis, or the execution of the following pace (we can have one pace without positioning). The tolerance output remains activated for the minimum time set in SET-UP, if placing in execution the following pace, it is changed the tolerance range. If the following pace does not show any positioning at a level, the output remains activated (because we remain in tolerance).
- Value **X41**. The axis is positioned at the programmed level and it is activated the tolerance output. Upon activation of step (I8) the pace is increased, the tolerance output is deactivated and it is automatically executed the new positioning.
- Value **X42**. The axis is positioned at the programmed level and it is activated the tolerance output. Upon activation of the stop (I8) we increase the pace and it is deactivated the tolerance output. To execute a new positioning you must provide a start (I2).
- Value **X50**. Pace jumping over without being placed in execution and with no toggling of the outputs.
- Value **X55**. The axis is positioned at the programmed level and it is activated the tolerance output. This value identifies the end of program, the last performable pace is the one previous to that with the value 55. The value of levels of shifting speed in percentage (**V**) and the code of outputs activation (**U**) will not be considered. If on an already existing program it is introduced a code "55" (end of program), the paces marked by the code introduced up to the following code "55" become a new program.

Continued on next page.

- Value **0XX**. The level introduced is absolute.
- Value **1XX**. The level introduced is incremental. The increment is made compared to the previous level. If it has been activated the output I8 and we wait for the start (I2), the Δ level is calculated compared to the level placed in execution with input I8. If in a cycle, the first level is incremental, the increment is made compared to the encoder calculation.
- Value **2XX**. The level is not placed in execution and only the outputs are enabled.



ENTERING OR ERASING A PACE IN A WORKING PROGRAM.

It is possible to choose from 3 different possibilities during the program introduction:

- Jump directly to a program pace.
- Insert a new program pace.
- Erase a program pace.

Description	Keyboard	Display
Access to the function.	F1	Scelta funzione?
Insert the desired function from the following list: F1 + 1 = Go to pace number. F1 + 2 = Insert pace. F1 + 3 = Erase pace.	$\begin{matrix} A \\ 1 \end{matrix} \div \begin{matrix} C \\ 3 \end{matrix}$	
Pressing the keys F1 + 1. Via numeric keyboard the operator may enter the pace desired and confirm with ENTER .	$\begin{matrix} F1 \\ \end{matrix} + \begin{matrix} A \\ 1 \end{matrix}$ $\begin{matrix} PASS \\ 0 \end{matrix} \div \begin{matrix} \rightarrow \\ 9 \end{matrix} \leftarrow$	Vai al passo Nr. 12
Pressing the keys F1 + 2. Letter "I" starts blinking. The value 250 indicates the pace in use. The operator, via numeric keyboard may enter the level (blinking) and confirm with ENTER . Upon confirmation with ENTER the level starts blinking to indicate its entering and so on until the entering of the last parameter. Upon confirmation with ENTER of the last parameter (increase code) the letter "I" disappears and the pace is written in memory. Pressing again "F1 + 2" the entering function is disabled.	$\begin{matrix} F1 \\ \end{matrix} + \begin{matrix} B \\ 2 \end{matrix}$ $\begin{matrix} PASS \\ 0 \end{matrix} \div \begin{matrix} \rightarrow \\ 9 \end{matrix} \leftarrow$	I 250 Q.2500.00 1 V 34 U 23C 12
N.B. Until it is activated the introduction function, you can use the other functions "Go to pace" and "Delete pace" too.		Errore! Memoria piena
If it is not possible to enter a new pace because memory is busy, the display shows for 3 seconds: Once 3 seconds are passed, the display shows again the pace concerned, without any change.		
Pressing the keys F1 + 3. To delete the pace confirm with ENTER .	$\begin{matrix} F1 \\ \end{matrix} + \begin{matrix} C \\ 3 \end{matrix}$	Cancella passo Nr. 12
N.B. If you have introduced all 99 programs, and you try to enter a new end of program, on the display appears for 3 seconds:		Errore! Troppi programmi
N.B. If you erase an end of program, and the new program which is made contains more than 250 paces, on the display appears for 3 seconds:		Errore! Troppi passi

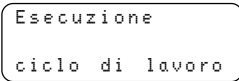


PROGRAMMING THE WORKING CYCLE

Description	Keyboard	Display
Interrupt an eventual cycle under performance and press the keys shown.	F1 + A 1	Numero cicli da eseguire 1234
The operator via the numeric keyboard can enter the number of cycles to be performed (max. 9999). Confirmation with ENTER :	PASS 0 ÷ 9 ↵	
The operator via the numeric keyboard may enter the first program to perform and the number of repetitions of the program itself (max. 9999). Upon confirmation with ENTER the display shows:	PASS 0 ÷ 9 ↵	1 Programma N.10 Nr. ripetiz. 15
Via the numeric keyboard the operator may enter the second program to perform and then perform the number of repetitions of the program itself. By entering the value 0 in the number of repetitions, a single program which has a number of repetitions the value of repetitions of the following program will be created. Upon confirmation with ENTER the display shows:	PASS 0 ÷ 9 ↵	2 Programma N.17 Nr. ripetiz. 0
To end the cycle to be performed, enter into the program number of the pace following the last one used, the 0 value.	PASS 0	5 Programma N.0 Nr. ripetiz. 0
N.B. It is possible to enter up to 9 paces. If you wish to set a single program for n. times, you must enter 1 in the number of cycles, in the first pace of the program to be performed, its repetitions and upon the request of the second pace you must set value 0.		
To exit from the function, press the key shown.	F1	

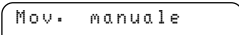


EXECUTION OF THE WORKING PROGRAM

Description	Keyboard	Display
Interrupt the positioning and access to the function of execution of the working program.	 + 	
The operator upon confirmation with ENTER , puts in execution the working cycle set with the function F1 and 1 .		
N.B. The first level of the new cycle can be placed in execution only at a start independently from the programmed pace code.		
To exit the execution of the working cycle press; the display shows again the displayings in use.		

SHIFTING OF AXIS IN MANUAL

The instrument allows to manually shift the axis. It is possible to move the axis from the keyboard in both directions with 2 different speeds. Once selected the manual function it is possible to move the axis backward with the key 7 and forward with the key 9. With the key 8 it's possible to select the speed slow or fast.

Description	Keyboard	Display
Access to the manual functions and select the visualization of axis movement.	 	
Display shows at bottom left the speed selected with the key 8 (L = slow, V = fast).		
Display shows at bottom right the axis level. During manual shifting the minimum and maximum level limits are enabled.		
With the keys shown it's possible to move the axis and to change the speed.	  	
To exit from the function, press the key shown.		



POSITIONING AT AN IMMEDIATE LEVEL

The instrument allows to manually shift the axis. It's possible to position automatically the axis to a level different from the levels selected in a working program.

Description	Keyboard	Display
Access to the manual functions and select the visualization of positioning at an immediate level.	 	Q.ta im. 23456.7 Cont. 12345.6
On the lower line appears the actual level. Through the keyboard the operator may insert the new level and confirm with ENTER . The axis will move to reach the entered value.	 ÷  	
To exit from the function press the key shown.		

PROCEDURE OF PRESET RESEARCH

The instrument allows to manage a manual preset research. It's possible to activate the preset research from the keyboard too (see dedicated chapter).

Description	Keyboard	Display
Access to the manual functions and select the preset research function.	 	Ricerca preset 12345.6
It is displayed the axis level. Upon confirmation with ENTER , the display starts blinking, the axis is moved to search the zero impulse and upon its activation the preset level is loaded. Now the axis achieves the research and the display stops blinking indicating the end of the preset research.		
To exit from the function press the key shown.		

BACKUP AND RESTORE FUNCTION

The instrument is provided with backup functions (data storage) and restore (data recovery); therefore it is possible to store all the instrument's parameters, apart from work programs, so that they can be recovered in the case of accidental loss or modification of parameter data.

Description	Keyboard	Display
Access to real backup and restore functions.	F1 + PASS 0	Password? 0
Enter access code "753" and confirm with ENTER ; a request is made to select the function required.	7 5 3 ENTER	1 = BACKUP 2 = RESTORE
Backup Press key 1 to select the (data storage) function. To execute backup of data, press ENTER , while to abort the procedure, press CLEAR . When data have been stored, two different messages may appear: - Backup procedure concluded correctly. Press any key to exit. - Backup procedure not concluded correctly. Press ENTER to repeat data backup, or press CLEAR to exit the function.	ENTER o CLEAR	BACKUP FUNCTION ENTER=Y CLEAR=N BACKUP FUNCTION SUCCESSFUL BACKUP FUNCTION FAILURE
Restore Press key 2 to select the Restore function (data recovery). To restore data, press ENTER , or press CLEAR to abort. Terminated the data recovery, two different messages may appear: - Restore procedure concluded correctly. Press any key to exit. - Restore procedure not concluded correctly. Press ENTER to repeat data restore, or press CLEAR to exit the function.	ENTER o CLEAR	RESTORE FUNCTION ENTER=Y CLEAR=N RESTORE FUNCTION SUCCESSFUL RESTORE FUNCTION FAILURE
To exit the function of Backup or Restore at any time, press key F1 or CLEAR .	F1 o CLEAR	
Note The messages relative to the BACKUP/RESTORE function are in English, even when in set-up it was possible to define another language.		



DISPLAYS

Description	Keyboard	Display
Upper display 1 2 3 Pace. 0 . 1 2 3 4 5 . 6 Absolute level.		123 0.12345.6 19 C. 2345.6
Lower display 1 9 Program. C . 2 3 4 5 . 6 Counting.		
Upper display 1 2 3 Pace. V . 1 0 0 % Selected speed. U . 1 0 5 Output code.		123 V.100%U.105 19 C.132 5432.1
Lower display 1 9 Program. C . 1 3 2 Pace code. 6 5 4 3 2 . 1 Eventual incremental level (appears with C1XX).		
Upper display Programmed cycles.		Cicli prog. 23 Cicli eseg. 06
Lower display Executed cycles.		
If the instrument is switched off when it is not in stop and performing a program, upon the restart of the instrument, on the display appears an error message. To recover a program after a switching off it is necessary to activate a stop before switching off power supply or execute a cycle restart.		Errore Restart ciclo
To exit deleting the alarm press the key		
If the operator introduces a value out of the correct range, an error message will be displayed for 1 second. After this the instrument request again the data.		Error!



ERROR CHECK DATA

Description	Keyboard	Display
The instrument allows the writing of a series of data (set-up, work programmes, etc.). At the exit from a function of data entry, the instrument sums ALL the data introduced. If for some reason (disturbances above the norm ...) only one single datum should be altered, the instrument, when switched on, will show the error message "Data error !!! Check data". This display calls attention to the fact that a datum has been altered and that there could therefore be later malfunctions. To cancel the display it is sufficient to press the shown key; however, it is necessary to check all the instrument's parameter data.		Data error!!! Check data

4 - 2 TABELS AND DIAGRAM OF POSITIONING

PROGRAM STRUCTURE

Example 1

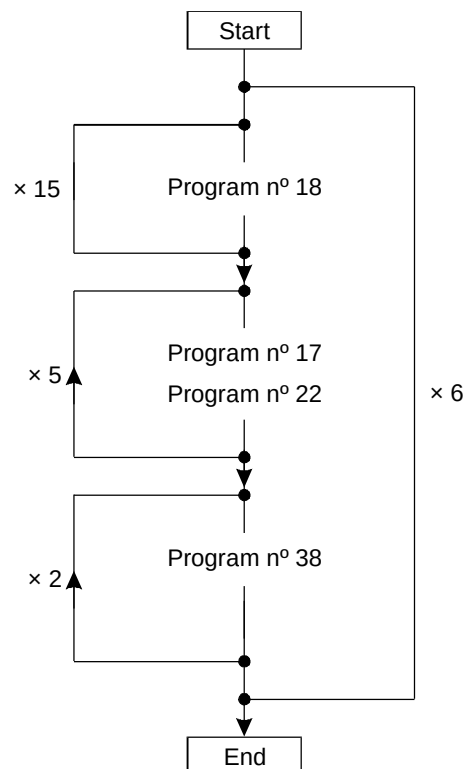
Program ↓ Steps								
1	89	1	2	3	/	/	/	
2	141	/	/	/	/	/	/	Pr1
NO	NO	/	/	/	/	/	/	
/	/	/	/	/	/	87	88	
/	/	89	90	91	/	/	/	Pr2
/	/	/	/	/	/	/	/	
/	/	/	/	/	/	/	/	
/	/	/	/	/	/	/	/	Pr2
/	/	/	/	/	/	/	230	
/	/	231	232	/	/	/	/	
NO	NO	/	/	/	/	/	255	Free steps

Example 2

Program ↓ Steps								
1	15	1	2	3	/	/	/	
2	24	/	15	16	17	/	/	Pr1
3	60	/	/	/	/	/	/	Pr2
4	31	/	38	39	40	41	42	Pr3
5	70	/	/	/	/	/	/	
6	55	/	/	/	/	/	/	
NO	NO	/	/	/	/	/	99	Pr4
/	/	100	101	/	/	/	/	
/	/	/	/	/	129	130	131	
/	/	132	/	/	/	/	/	Pr5
/	/	/	/	/	/	199	200	Pr6
/	/	201	202	/	/	/	/	
NO	NO	/	/	/	/	/	255	

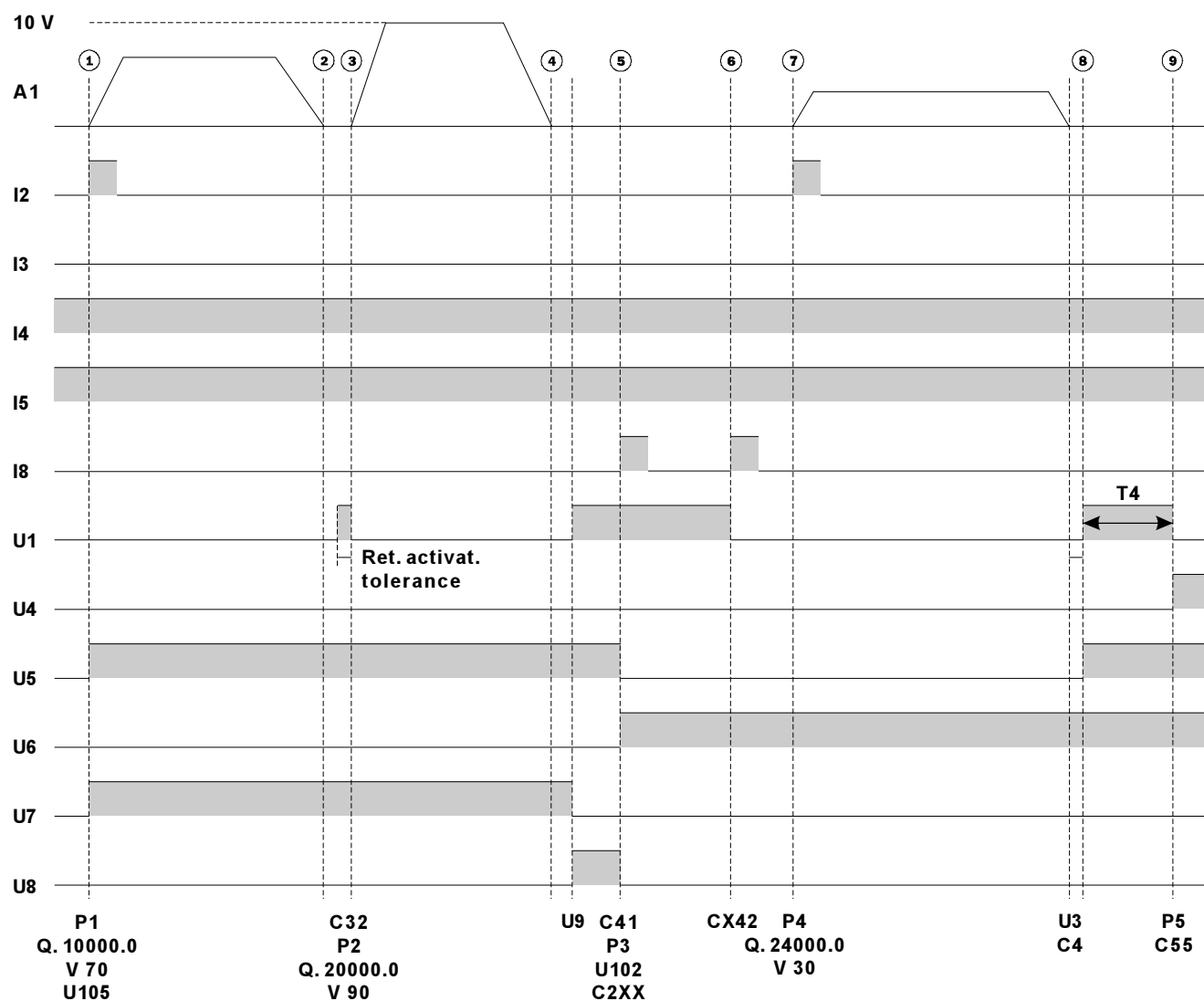
PROGRAMMING THE WORKING CYCLE

This example refers to the programming example shown in page 32.



Upon performance of the 6th cycle, at the last pace of the 2nd repetition of program n. 38, it is activated the output of end of cycle.

POSITIONING DIAGRAM



I2 = Start.

I3 = Stop.

I4 = Manual / Automatic.

I5 = Startup enabling.

I8 = Pace increase.

U1 = Tolerance.

U4 = Program end.

U5 = 1st programmable output.

U6 = 2nd programmable output.

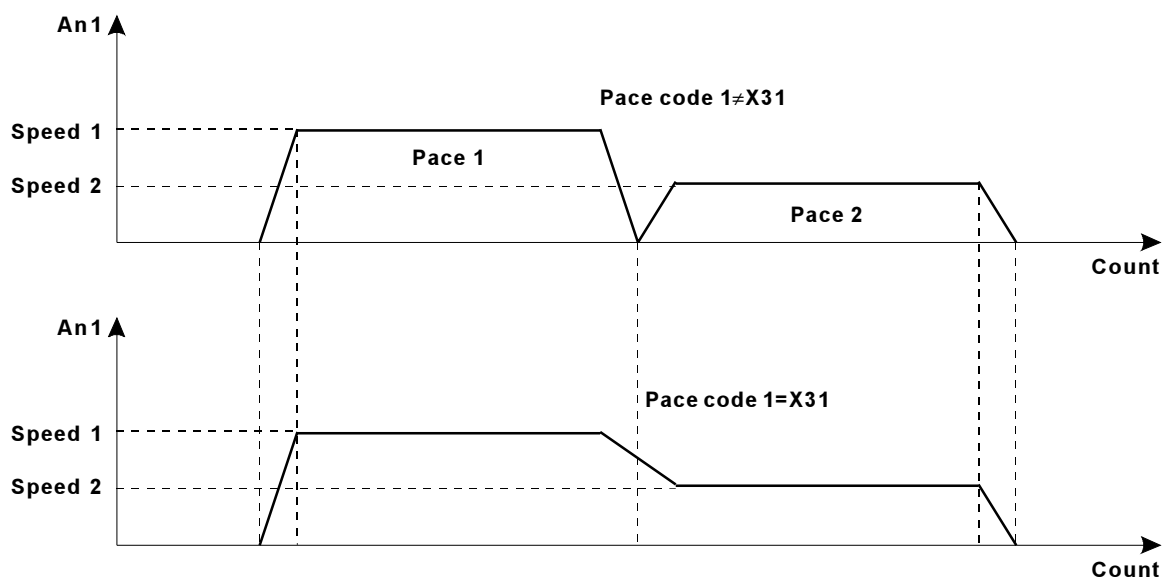
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U7 = 3rd programmable output.

U8 = 4th programmable output.

- 1) After placing in execution the program n. 12 through the keys **F1** and **2** it is necessary to activate the start to begin working. The first pace with outputs code 0XX activates the outputs U5÷U8 selected at the beginning of the pace, i.e. at the start.
 - 2) The axis moves to the level (10000.0) with speed at 70% and enters the range of tolerance.
 - 3) After the delay of tolerance activation output U1 is activated and then the pace 1 is achieved. The code of pace 1 has value 32, so the toggling to pace 2 is immediate and the axis restarts to go to the new level (20000.0) with speed at 90%.
- N.B.** The tolerance outputs will remain activated for the time set in SET-UP. The new positioning is executed when the output U1 becomes OFF.
- 4) Upon the activation of output U1 (second pace), the outputs U5÷U8 change their state because the outputs code of the second pace has value 1XX (setting at the end of pace).
 - 5) The pace code of the second pace is 41, so to place in execution the program 3 you must activate the input I8. The pace 3 has the pace code 2XX, so the positioning is blocked and outputs U5, U8 are enabled at the pace beginning because the code is 0XX.
 - 6) The code of the pace 3 is X42, so to execute the pace you must activate the input I8 and then the start input must be activated.
 - 7) At the start pace 4 is placed in execution (positioning at the level 24000,0 with speed at 30%).
 - 8) Upon activation of tolerance output, outputs U5 and U8 are set (code of outputs 1XX) and the timer selected with the pace code 00X starts.
 - 9) At the end of the timer the pace increase is executed. Pace 5 is the end of program and then the output of cycle end (U4) is activated.

POSITIONING DIAGRAM WITH PACE CODE DIFFERENT OR EQUAL TO 31





CHAPTER 5

ASSISTANCE

Input and output troubleshooting

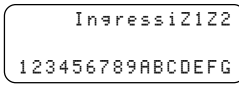
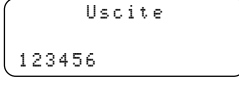
How to complete the technical assistance fax form

Warranty

5 - 1 INPUT AND OUTPUT TROUBLESHOOTING

The instrument provides troubleshooting for the input and digital output logic status; according to the numbers displayed, it is possible to understand whether an input arrives at the instrument and if an output has been excited. The first display, after access to the troubleshooting function, relates to the input status; if number 1 is displayed, this indicates that input 1 has been activated; if number 2 is displayed, this indicates that input 2 has been activated, and so on. Input Z (transducer zero impulse) is signalled with a C; if displayed, the zero impulse is not present; if not displayed, the zero impulse is supplied to the instrument.

The following display relates to the logic status of the digital outputs. The same correspondance applies as with the inputs (equal number corresponds with equal output); e.g.: the presence of number 4 indicates that the instrument is exciting output 4.

Description	Keyboard	Display
Access the troubleshooting function. The input status will be displayed.	 + 	
Press the arrow key to pass to the display of output state.		
N.B. The display of the inputs and outputs can be called up at any time except during the introduction of data and when giving manual keyboard commands.		
To exit the function, press the shown key. The screen returns to showing the display in use.		

5 - 2 HOW TO COMPLETE THE TECHNICAL ASSISTANCE FAX FORM

If we are to provide you with a speedy, efficient and high-quality service, we need your help.

If ever you need the assistance of QEM in dealing with any technical problems that may arise in your applications and, even though all the instructions in the "Installation, maintenance and servicing" manual have been followed, the problem persists, we invite you to fully complete the fax form enclosed with the installation, maintenance and servicing manual and send it to the QEM assistance office.

In this way, our service engineers will have all the essential information for the understanding of your problem (thus avoiding long and costly telephone calls).

In thanking you for co-operation, we wish you all the best in your work.

NOTE

If ever you have to send an instrument to us for repair, please read the points below carefully.

- If possible, use the original packaging. In any event, the packaging must protect the instrument from knocks during its journey.
- Enclose a detailed description of the problem that has occurred, along with the part of the wiring diagram where the instrument is located, in the package. If the problem involves data storage, enclose the instrument set-up programming (set-up, work measurements, auxiliary parameters ...).
- If necessary, ask us specifically for an estimate on the repairs. If no estimate is requested, the cost will be calculated on completion.
- Our service engineers will give priority to instruments that are sent to in accordance with the instructions in these notes.

5 - 3 WARRANTY

The warranty conditions are as stated in the general conditions of sale.



NOTE